



# PATENT SPECIFICATION

Application Date: March 5, 1938. No. 6912/38.

512,520

Complete Specification Left: Feb. 25, 1939.

Complete Specification Accepted: Sept. 19, 1939.

## PROVISIONAL SPECIFICATION

### Improvements in Machines for Testing the Hardness of Materials

We, W. & T. AVERY LIMITED, of Soho Foundry, Birmingham, a Company incorporated under the Laws of Great Britain, and HARRY YATES, of the Company's address, a British Subject, do hereby declare the nature of this invention to be as follows:—

This invention has reference to improvements in machines for testing the hardness of materials, and is applicable more particularly to machines of the type described for example in the Complete Specification of British Letters Patent No. 422,972.

The object of the present invention is to enhance the accuracy of a test carried out by machines of this type, and to provide a simple means for adjusting the setting of the automatic indicating mechanism to ensure an accurate reading of the indications.

The invention consists of improvements in hardness testing machines of the kind hereinbefore referred to, characterised in that when a test is being accomplished the penetrator carrier element is entirely free of contact with its normal support so that during a test the element only has three points of contact, (one) where the penetrator contacts with the test piece, (two) where the penetrator carrier element contacts with the knife-edge of the main weighted lever, and (three) at its upper end where the motion of the said element is transmitted through a transfer lever to the automatic indicating mechanism, the three said points of contact being in vertical alignment through the axis of the penetrator carrier element, the invention is further characterised in that at the point where the upper end of the said element contacts with the transfer lever through which the movement of the element is communicated to the automatic indicating mechanism there is provided an adjustable saddle which forms part of the said lever whereby the automatic indicating mechanism may be set or adjusted before a test is effected.

It will not be necessary to describe in any detail the construction and operation of a hardness testing machine of the

type hereinbefore referred to as this follows the generally accepted practice and has already been described in the prior British Patent Specification hereinbefore referred to.

The particular features which constitute the present invention will now be described.

The penetrator carrier element takes the form in the main of a rod of circular section which is normally supported by means of two conical seatings adjacent its opposite ends on conical bearing seats formed in the head framework of the machine. The lower end of this rod has coupled thereto the penetrator element which may partake of various forms, for instance, a hardened steel cone point, a ball, or a diamond, this penetrating element being removably coupled to the main section of the carrier element by a cam and ball locking sleeve connection of known type, so that any interchange may be made to suit different forms of test or for replacement purposes. Adjacent the upper end of the penetrator carrier element there is provided a bearing block, or blocks, which is or are adapted to support the load knife-edge of the main weighted lever through which the predetermined or standard load is applied to the specimen. Above the said bearing block, or blocks, the carrier element is connected to a stool which constitutes the upper extension of the said element. The top face of this stool contacts with a hardened steel cross pin which is mounted in and forms part of a saddle which is pivotally mounted on the transfer lever by means of which the motion of the penetrator carrier element is transmitted to the automatic indicating mechanism. The said saddle is provided with two oppositely extending lateral arms, one adapted to constitute a mounting for a set screw and the other having contact with a leaf spring which is fixed to the said transfer lever.

It will be appreciated that by rotating the set screw the saddle is rocked about its pivot on the transfer lever and within fine limits the point of connection of the cross pin with the upper face of the stool

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mounted on the penetrator carrier element may be varied so that the automatic indicating mechanism may be accurately set in relation to the associated parts of the machine, that is, should the zero or other initial position of the indicator be out of register the

indicating mechanism can be adjusted and properly set before a test is initiated.

Dated this 4th day of March, 1938.

SHAW, BOWKER & FOLKES,

8, Waterloo Street, Birmingham, 2,  
Chartered Patent Agents,  
Agents for Applicants.

## COMPLETE SPECIFICATION

### Improvements in Machines for Testing the Hardness of Materials

10 We, W. & T. AVERY LIMITED, of Soho Foundry, Birmingham, a Company incorporated under the Laws of Great Britain, and HARRY YATES, of the Company's address, a British Subject,  
15 do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

20 This invention has reference to improvements in machines for testing the hardness of materials, and is applicable more particularly to machines of the type described for example in the complete  
25 Specifications of British Letters Patent Nos. 353,729 and 422,972.

The object of the present invention is to enhance the accuracy of a test carried out by machines of this type and to provide  
30 a simple means for adjusting the setting of the automatic indicating mechanism to ensure an accurate reading of the indications.

The invention consists of improvements in hardness testing machines of the kind hereinbefore referred to incorporating a penetrator carrier element which is provided with seatings for effecting its location in the out of action position, knife-edge means through which  
40 the load is applied to the said penetrator carrier element during a test, said knife edge being located in the vertical plane containing the point of the penetrator, a stool forming part of the penetrator  
45 element, a transfer lever for communicating movement of the carrier element to the automatic indicating mechanism, a saddle pivotally mounted on the transfer  
50 lever and having a line contact with the stoolsaid knife-edge and the penetrator point and means for adjusting the position of the saddle relatively to the  
55 transfer lever.

The invention will now be described with particular reference to the accompanying sheet of drawings, wherein:—

60 Figure 1 is a view partly in elevation and partly in section of the improved hardness testing machine.

Figure 2 is a view on an enlarged scale

of the portion of the testing machine illustrated in Figure 1 with which the invention is concerned, and

Figure 3 is a fragmentary view in part sectional front elevation of the means for transmitting the movement of the penetrator carrier element to the automatic  
70 indicating mechanism.

As the machine illustrated in Figure 1 of the drawings follows the generally accepted practice and has been described already in so far as its main features are concerned in the prior British Patent Specification No. 422,972 hereinbefore referred to the machine itself will not be described in any detail but only the particular features which constitute the  
80 present invention.

The penetrator carrier element takes the form in the main of a rod 4 of circular section which is normally supported by means of two conical seatings 4<sup>a</sup>, 4<sup>b</sup> adjacent its opposite ends on conical bearing seats 5<sup>a</sup>, 6<sup>a</sup> formed in sleeves 5 and 6 secured in the head framework 7 of the machine. The lower end of this rod 4 has coupled thereto the penetrator element 8 which in the form shown is a hardened steel cone pointed member although a ball or a diamond may be substituted therefor. This penetrating element 8 is removably coupled to the main section of the carrier element 4 by  
90 a cam and ball locking sleeve connection 9 of known type, so that any interchange may be made to suit different forms of test or for replacement purposes. Adjacent the upper end of the penetrator  
100 carrier element there is provided a bearing block 10 which is adapted to support the load knife-edge 11 of the main weighted lever 12 through which the predetermined or standard load consisting of the weights 12<sup>a</sup> is applied to the specimen upon the lowering of the support 12<sup>b</sup>. Above the said bearing  
105 block 10 the carrier element is connected to a stool 4<sup>c</sup> which constitutes the upper extension of the said element. The top face of this stool 4<sup>c</sup> contacts with a hardened steel cross pin 13<sup>a</sup> which is mounted in and forms part of a saddle 13 which is pivotally mounted by means of  
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a pin 14 on the transfer lever 15 by means of which the motion of the penetrator carrier element 4 is transmitted to the automatic indicating mechanism 16. The said saddle 13 is provided with two oppositely extending lateral arms 13<sup>b</sup>, 13<sup>c</sup>, one arm namely 13<sup>b</sup> being adapted to constitute a mounting for a set screw 17 whereas the other namely 13<sup>c</sup> has contact with the free end of a leaf spring 18 which is bolted at its other end to the said transfer lever 15.

The specimen is placed on top of the screw 19 which is caused to be raised so as to bring the specimen into contact with the penetrator element 8 and to lift the penetrator carrier element 4 bodily off its seatings 5<sup>a</sup>, 6<sup>a</sup> to apply the initial loading in known manner and as set out in Patent Specification No. 353,729.

It will be appreciated that the cone point of the penetrator carrier element 4, the knife-edge of the bearing block 10 and the point of contact between the stool 4<sup>c</sup> and the cross pin 13<sup>a</sup> are in the vertical plane containing the axis of the penetrator carrier element 4 when the said element is raised from its seatings 5<sup>a</sup>, 6<sup>a</sup> during a test.

It will be appreciated that by rotating the set screw 17 the saddle 13 is rocked about its pivot 14 on the transfer lever 15 and within fine limits the location of the line of contact of the cross pin 13<sup>a</sup> relatively to the pivot pin 14 may be varied so that the automatic indicating mechanism 16 may be accurately set initially in relation to the associated parts of the machine.

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

1. A hardness testing machine of the kind hereinbefore referred to incorporat-

ing a penetrator carrier element which is provided with seatings for effecting its location in the out of action position, knife edge means through which the load is applied to the said penetrator carrier element during a test, said knife-edge being located in the vertical plane containing the point of the penetrator, a stool forming part of the penetrator element, a transfer lever for communicating movement of the carrier element to the automatic indicating mechanism, a saddle pivotally mounted on the transfer lever and having a line contact with the stool in the vertical plane containing the aforesaid knife-edge and the penetrator point and means for adjusting the position of the saddle relatively to the transfer lever.

2. A hardness testing machine according to Claim 1 wherein the contact between the saddle and the stool is in the form of a cross pin carried by the saddle which rests on the upper end of the stool.

3. A hardness testing machine according to Claim 1, wherein the saddle is provided with arms, one of which rests on the free end of a spring secured to the transfer lever and the other of which carries an adjustable set screw the nose of which is caused to contact with the adjacent surface of the transfer lever, said spring and set screw providing means for effecting the adjustment of the saddle relatively to the transfer lever.

4. A hardness testing machine having a penetrator carrier element, constructed, arranged and adapted for use substantially as herein described with reference to the accompanying sheets of drawings.

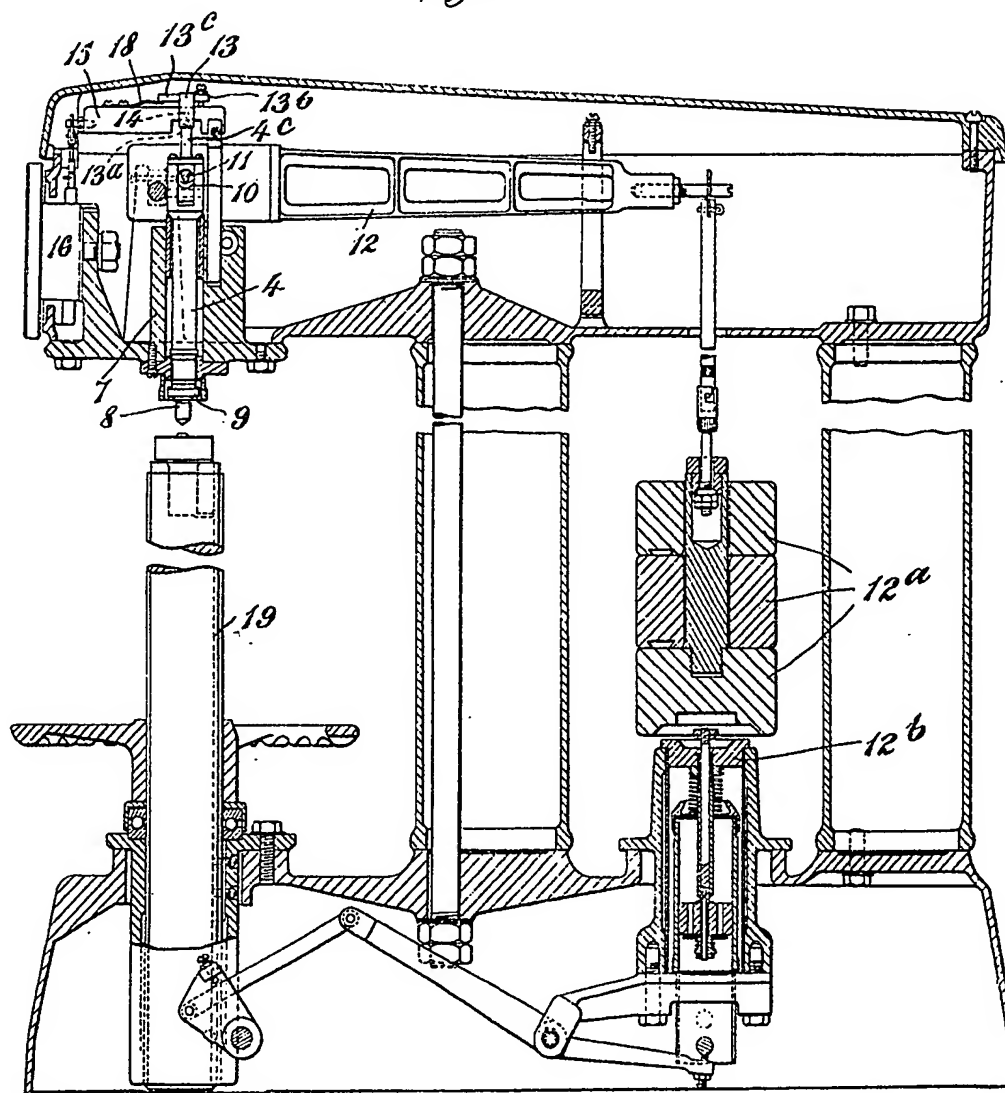
Dated this 24th day of February, 1939.

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Fig. 1.

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Fig. 2.

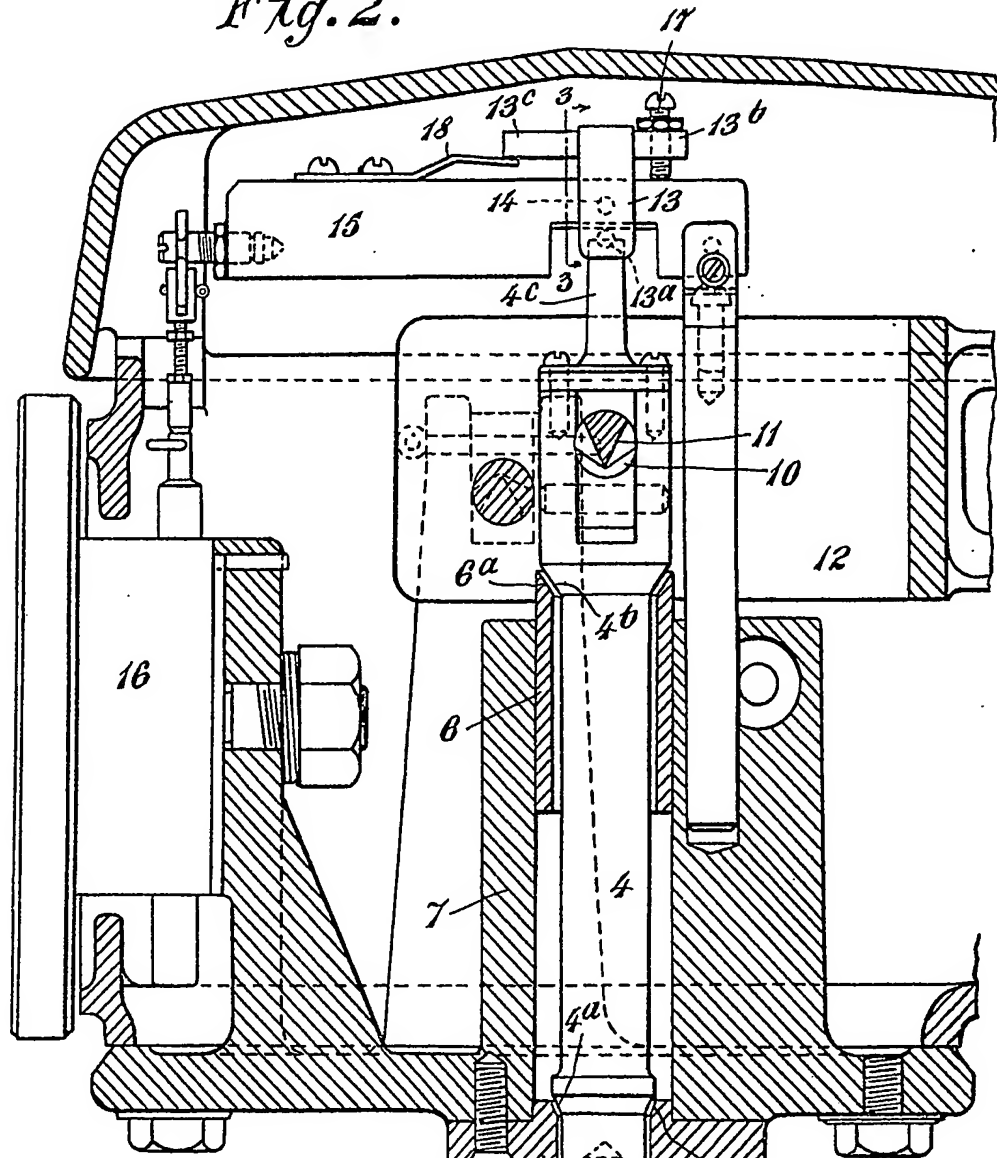


Fig. 3.

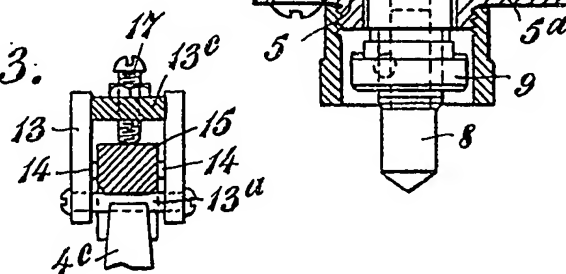


Fig. 1.

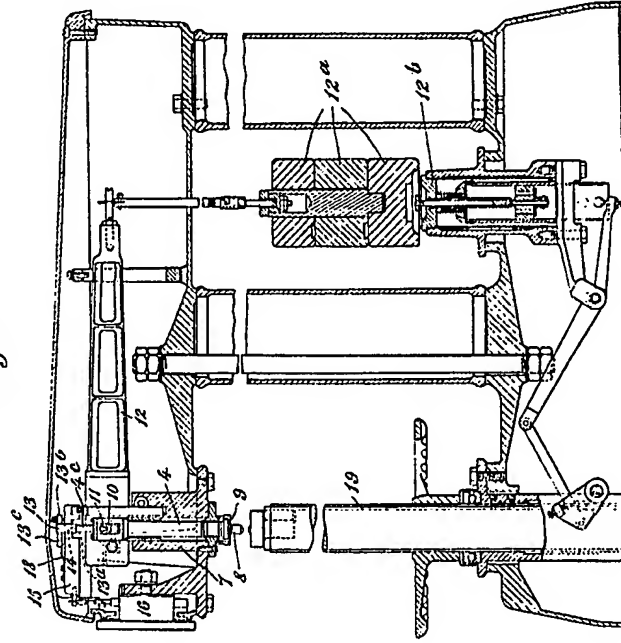


Fig. 2.

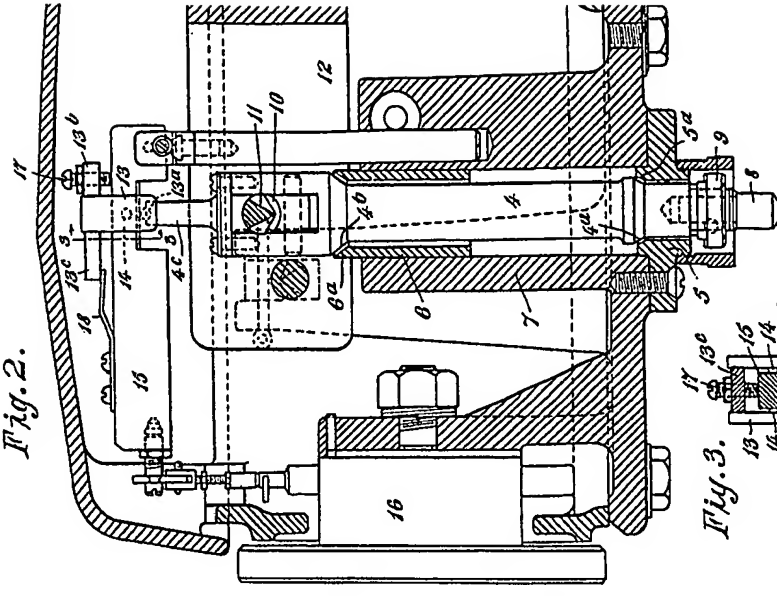
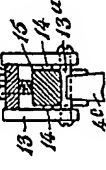


Fig. 3.



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